Appl. No. 10/006,795
Amdt. dated September 1, 2005
Reply to Office Action of June 13, 2005

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Amendments to the Specification:

Please replace paragraph [22] with the following amended paragraph:

[22]   According to the invention, in a telecommunication system, a method for co-channel interference identification and mitigation employs adaptive sequence detection in connection with a model composed of a signal of interest and a combination of other signals which constitute interference in a channel of interest, wherein the signal of interest is distinguished from the interference by adaptive tracking of signal parameters of all identifiable signals. In a particular embodiment, the process involves estimating the number and time spans of co-channel interference channels based on maximum likelihood estimation and minimum description length from training information derived from a single time division multiple access packet; and then applying the estimate to mitigation of co-channel interference at a receiver. Per-survivor-processing is one technique for adaptive sequence detection.

Please replace paragraph [41] with the following amended paragraph:

[41]   According to this embodiment, the outputs z_k from the FE processors 220 corresponding to the n_s^{th} ($n_s = 1, \ldots N_s$) sample of the mth ($m = 1, \ldots M$) array element can be arranged in an ($N \times 1$) vector $z_{n_s}^{(m)}$ which can be expressed as

(Eq. 4)
$$z_{n_s}^{(m)} = A_L \cdot h_{n_s}^{(m)} + w_{n_s}^{(m)}$$

where

(Eq. 5)
$$A_L = \begin{bmatrix} a_1^1 & \cdots & a_{1-L_{1}+1}^1 & \cdots & a_1^{N_I} & \cdots & a_{1-L_{N_I}+1}^{N_I} \\ \vdots & \ddots & \vdots & \ddots & \vdots & \ddots & \vdots \\ a_N^1 & \cdots & a_{N-L_{1}+1}^1 & \cdots & a_N^{N_I} & \cdots & a_{N-L_{N_I}+1}^{N_I} \end{bmatrix}$$

is the ($N \times L$) data matrix. Here, a combined time span, L, is defined as the sum of the ~~time spans, L_i, of all modeled signals.~~ individual time spans, L_i. L_i is the time span of the IR, or the intersymbol interference channel response, associated with the ith signal. N_I is the total number of modeled signals present in the channel, including the desired signal and the CCI signals. ~~L_i is the time span of the IR, or the intersymbol interference channel response, associated with the ith~~

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signal. Also, a_k^i is the kth data symbol of the ith signal's training sequence, $\mathbf{h}_{n_s}^{(m)}$ is the (L×1)

overall IR vector and $\mathbf{w}_{n_s}^{(m)}$ is a zero-mean, complex Gaussian random vector with covariance

matrix $N_o \mathbf{I}_{NxN}$. Since the noise is independent between samples and array elements, conditioned

on the overall IR vector, the probability density function (pdf) of the FE output vector over all

samples and array elements, $f(\mathbf{z}|\mathbf{h})$, is given by

(Eq. 6)
$$\frac{1}{(\pi N_O)^{MN_s N}} \exp\left[-\frac{\sum_{m=1}^{M} \sum_{n_s=1}^{N_s} \left\| \mathbf{z}_{n_s}^{(m)} - \mathbf{A}_L \cdot \mathbf{h}_{n_s}^{(m)} \right\|^2}{N_O} \right]$$

Please replace paragraph [42] with the following amended paragraph:

[42]   The problem of determining the number of CCI signals and the time spans $\underline{L_i}$ of all

signals is a model selection problem, which can be stated as follows: Given the FE output vector

and a parameterized family of pdf's given by Eq. 6, select the model (*i.e.*, the parameters N_I and

$\{L_i\}_{i=1}^{N_I}$) that best fits this output. Here, The present embodiment uses a Minimum Description

Length (MDL) principle to select the model that minimizes

(Eq. 7)
$$\mathbf{MDL}\left(N_I, \{L_i\}_{i=1}^{N_I}\right) = -\ln\left[f\left(\mathbf{z}|\hat{\mathbf{h}}\right)\right] + \frac{1}{2} p \ln[N]$$

where $\hat{\mathbf{h}}$ is the ML estimate of $\mathbf{h}$, with elements

(Eq. 8)
$$\hat{\mathbf{h}}_{n_s}^{(m)} = \left[\mathbf{A}_L^H \mathbf{A}_L \right]^{-1} \mathbf{A}_L^H \cdot \mathbf{z}_{n_s}^{(m)}$$

and p is the number of unknown parameters in the particular model. Substituting Eq. 8 into Eq.

6 and noticing that the number of unknown parameters in the model of Eq. 4 is $2LMN_s$, Eq. 7

becomes

(Eq. 9)
$$\mathbf{MDL}\left(N_I, \{L_i\}_{i=1}^{N_I}\right) = \frac{1}{N_O} \sum_{m=1}^{M} \sum_{N_s=1}^{N_s} \left\| \mathbf{P}_L^{\perp} \cdot \mathbf{z}_{n_s}^{(m)} \right\|^2 + LMN_s \ln[N]$$

where

(Eq. 10)
$$\mathbf{P}_L^{\perp} = \mathbf{I}_{NxN} - \mathbf{A}_L \left[\mathbf{A}_L^H \mathbf{A}_L \right]^{-1} \mathbf{A}_L^H$$

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Please replace paragraph [46] with the following amended paragraph:

[46]   The branch metrics of the VA are computed as follows:

(Eq. 12) $$\Gamma\left(\boldsymbol{\sigma}_k, \boldsymbol{\sigma}_{k+1}\right) = \left\|\mathbf{z}_k - \mathbf{A}_k\left(\boldsymbol{\sigma}_k, \boldsymbol{\sigma}_{k+1}\right)\!\mathbf{h}_k\right\|^2$$

where the data matrix $\mathbf{A}_k\left(\boldsymbol{\sigma}_k, \boldsymbol{\sigma}_{k+1}\right)$ is constructed based on the hypothesized data symbols

corresponding to the transition $\boldsymbol{\sigma}_k \rightarrow \boldsymbol{\sigma}_{k+1}$. The trellis size is determined by the time spans $\underline{L_i}$ ~~of~~

~~all modeled signals~~. As defined previously, $\underline{L_i}$ is the time span of the IR, or the intersymbol

interference channel response, associated with the ith signal. ~~the combined time span, L, is the~~

~~sum of the time spans, L_i, of all modeled signals.~~ The joint trellis has M^{L-N_I} states, with M^{N_I}

branches entering each state.

Please replace paragraph [52] with the following amended paragraph:

[52]   The range of possible channel models is constructed by modifying one or more of the

following variables: (1) N_I, the number of modeled signals, which includes the desired signal

and all of the CCI signals (assuming there is always one desired signal, controlling this variable

is equivalent to varying the number of CCI signals), (2), $\{L_i\}_{i=1}^{N_I}$, $\underline{L_i}$ being the time span of the IR,

or the intersymbol interference channel response, associated with the ith signal. ~~the time span~~

~~corresponding to each of the modeled signals,~~ and (3), $\{\underline{a_i}\}_{i=1}^{N_I}$, the training sequence in the

training portion of each of the modeled signals.